

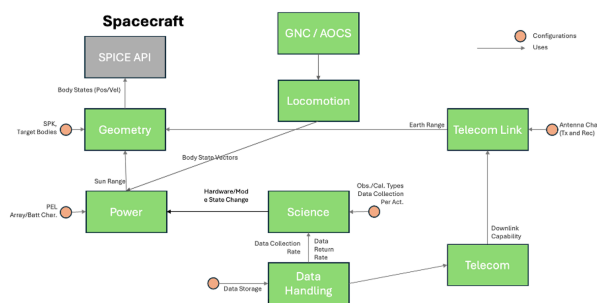
FY24 Strategic Initiatives Research and Technology Development (SRTD)

Improving Rover Operations via Quantitative Mission Modelling

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Strategic Focus Area: Ground Autonomy for Long Range Rover Operations | **Strategic Initiative Leader:** Tara A Estlin

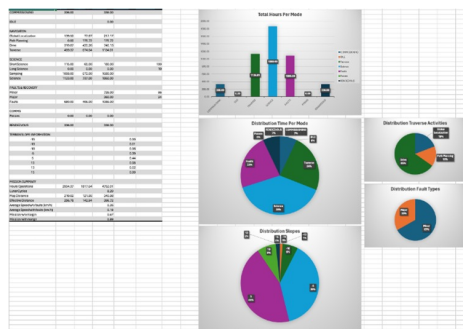
Objectives: The project's goal is to create a structured method for evaluating new rover autonomy capabilities, factoring in the relationships between autonomy, operations design, and communication infrastructure. A modular software framework will be designed, with key components prototyped and tested via trade studies targeted on two missions: the Endurance lunar mission and Mars 2020 extended mission. The framework will help identify impactful autonomous capabilities, efficient operations design, and communication needs for successful surface missions. The trade studies will model key aspects of the rover and communication architecture, including drive speed, fault frequency, power constraints, and planning cadence. Additionally, Design Simulations will validate model assumptions and improve understanding of operations concepts.



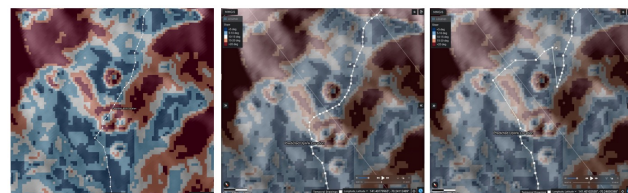
Endurance tailoring of VIOLET software infrastructure.



Representative timeline view of simulation result.



Representative simulation summary report.



Pre-mission strategic path goes through high slope terrain RP's compared moving to lower slope terrain... ...with more conservative plan with longer route

Portion of Endurance traverse considered by rover planners during second Design Simulation.
(using MMGIS tool with custom overlays)

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California Institute of Technology
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www.nasa.gov

RPD-000 Clearance Number: CL#00-0000

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Publications:

Juan M. Delfa Victoria, Michael McHenry, Itai Zilberstein, Eric Ferguson, Matthew L. Dailis, Alberto Candela, "VIOLET: Pioneering Web-Based Multi-Mission Analysis and Simulation with the Aerie framework" submitted to Space Ops 2025 - 18th International Conference on Space Operations, Montreal, Quebec, Canada

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